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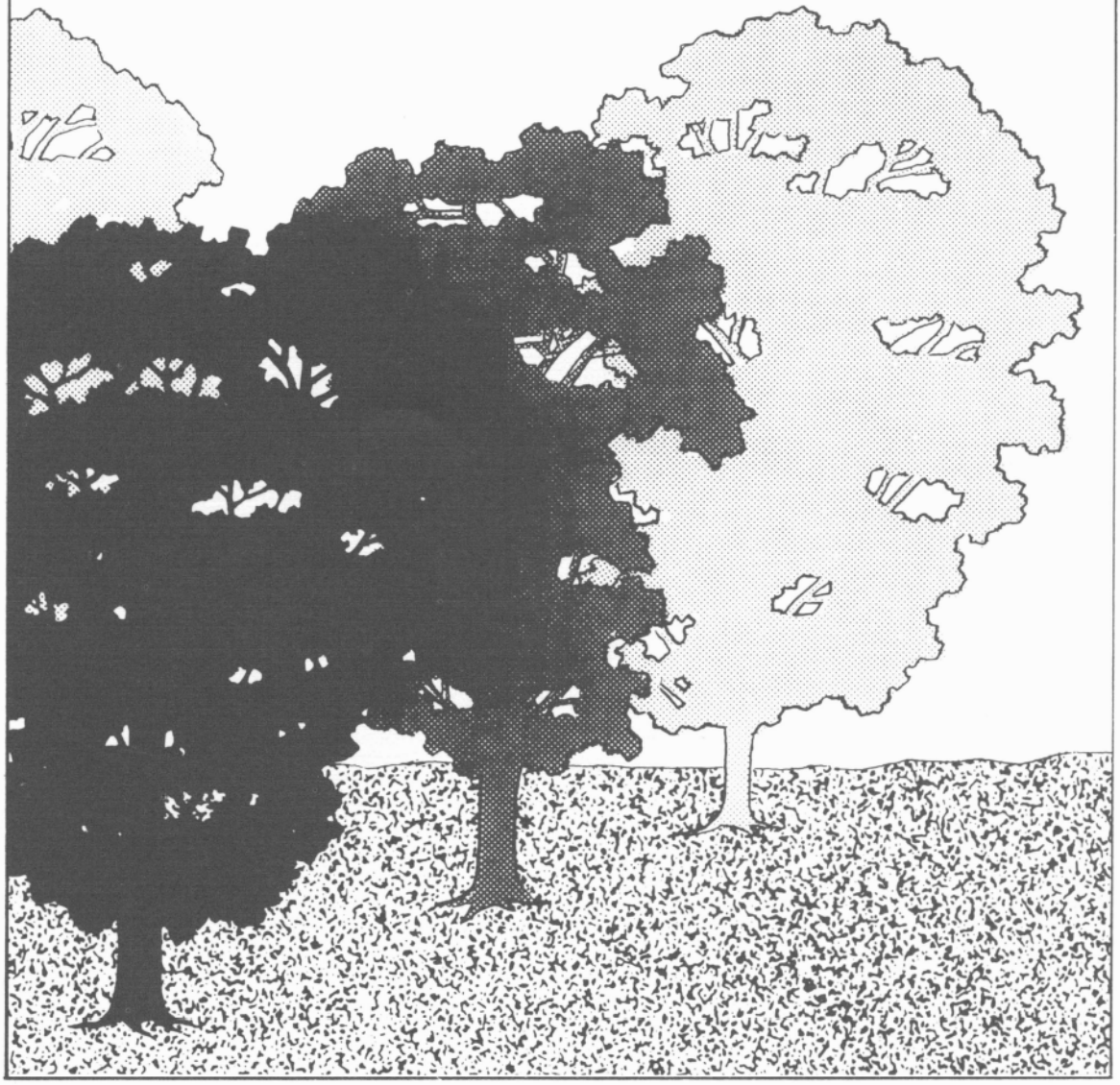
Pecan Diseases



Texas Agricultural Extension Service · The Texas A&M University System
Daniel C. Pfannstiel, Director · College Station, Texas

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Pecan Diseases

*Jerral D. Johnson**

To produce a bountiful nut crop a pecan tree must be protected from attack by destructive diseases. Diseases reduce the total national pecan production by an average of 21 percent each year. And each year diseases completely destroy many pecan trees. Approximately 80 leaflets are required to produce a pecan; if disease destroys part of the foliage on a tree, then production will be reduced. Pecan trees must maintain a certain level of carbohydrates in the foliage for production to occur each year. The leaves are the only source of this food supply.

Pecan diseases, especially those caused by fungi, can spread rapidly throughout an orchard during the growing season. During periods of frequent rains or dews, the spores of the disease-causing fungi germinate and invade the young, tender tissues of the shoots, leaves and nuts. Under conditions of prolonged damp weather and high humidity some disease-causing organisms reproduce at a rapid rate and cause severe shedding of leaves and nuts. Repeated applications of fungicides are required during these periods to keep foliage healthy and to produce a marketable crop.

In order to control diseases the pecan grower must understand the natures of the various diseases that threaten his crop, and use certain cultural practices which help to reduce damage from these diseases.

CAUSES OF PECAN DISEASES

Pecan diseases are caused by either fungi, bacteria, viruses, nematodes, physiological causes or mycoplasma.

The most numerous and widespread fungal diseases are caused by microscopic molds.

Bacterial disease organisms, unlike the disease-producing fungi, are single-celled and can be seen only under a microscope. Bacterial diseases are of less economic importance than fungal diseases.

Nematodes are small, microscopic, worm-like animals which live in the soil. Root knot nematodes, the most important, feed on the root system and induce the formation of small galls.

Virus diseases are caused by extremely small agents which can be observed only with an electron microscope.

Physiological disorders are caused by a variety of environmental conditions such as infertile soil, excessive moisture and the degree of available nutritional mineral elements to the growing tree. These environmental factors are manifested by specific symptoms.

FOLIAGE AND NUT DISEASE

Scab

Pecan scab, caused by the fungus *Fusicladium effusum* (Wint.), is the most destructive disease of pecans in Texas. The fungus invades the young, rapidly growing shoots and leaves and later the developing nuts. Severely infected nuts on highly scab-susceptible varieties drop or fail to develop resulting in a total nut crop loss. Early season defoliation often occurs in seasons of frequent rains and high humidity since these conditions facilitate the rapid development and spread of the scab fungus.

The scab fungus overwinters in infected shoots and in old shucks and leaves. In the spring when temperature and moisture conditions become favorable, the fungus begins to grow and within a few days produces a large number of spores. These spores are spread by air currents

*Extension plant pathologist, The Texas A&M University System.

and rain to newly developed leaves where they germinate and invade the tender tissues. The fungus produces a great number of spores on the surfaces of these primary infection sites, and spreads throughout the tree infecting other young shoots, leaves and nuts.

Scab disease development is favored by rainy periods and mild temperatures. Under these conditions, spores of the fungus in contact with the wet surface of a leaflet or nut germinate rapidly, invade the tender tissues and initiate infection within 6 hours. Lesions resulting from these infection sites become visible to the naked eye within 7 to 14 days, depending on environmental conditions. A period of warm, dry weather following infection may retard lesion development.

Primary infection lesions occur on the lower leaf surfaces and are usually olive brown, somewhat elongated in shape and vary in size from a barely discernible dot to a lesion 1/4 inch or more in diameter. Frequently, adjacent lesions coalesce forming large, very dark lesions. Primary scab lesions commonly occur on or along the leaflet veins, but can be found between the veins on the underleaf surface. On the nuts, scab lesions appear as small, black dots which are elevated or sunken in older infections. Adjacent lesions on the nuts may coalesce forming large, sunken, black lesions. When infection is severe, the entire nut surface is black, pecan development is arrested and the nuts drop prematurely.

Pecan varieties vary in their susceptibility to scab disease. Among the highly susceptible varieties are Burkett, Delmas, Western, Moore, Halbert, Wichita, Cherokee, Mahan and most western varieties. Desirable, Success, Sioux, Cheyenne, Apache and Mohawk are moderately resistant. Shawnee, Caddo, Stuart and Choctaw varieties are resistant to the scab fungus.

Control. The control of pecan scab depends primarily on the protection of tender leaf, nut and shoot surfaces with applications of an effective fungicide. A protective film of fungicidal chemical prevents infections by keeping the spores from developing normally. Unfortunately, once the fungus has invaded the tissues it is no longer vulnerable to fungicides. Therefore, thorough coverage of leaf, nut and shoot surfaces with a fungicide must be maintained to prevent disease development.

Sanitation measures such as removal of old, infected shucks, leaves and stems within trees, and plowing or disk harrowing under fallen leaves and shucks will help reduce primary infections. Air circulation helps reduce disease occurrence, high density plantings will be more prone to have severe disease problems than widely spaced trees which receive adequate sunlight and air movement. The circulation in an orchard is important in the spread of all foliar diseases. Demonstrations using smoke bombs have shown that the smoke is drawn up through the tree. Therefore, spores produced on diseased shucks would be drawn up through the tree where they could infect the leaves.

NUT DISEASES

Pink Mold

Pink mold, *Cephalothecium roseum* (Corda), usually occurs on nuts infected with the scab fungus. The pink mold fungus apparently enters the nuts through scab lesions on the shucks and continues to develop and produce masses of pink spores on shuck surfaces until late fall. The fungus sometimes invades the kernels of thin-shelled pecan varieties, causing "pink-rot" which is characterized by an oily appearance of the nut shell and a rancid odor.

Control. Pink mold rarely occurs in the absence of scab disease. In areas where scab disease control is regularly practiced, pink mold is not a problem.

Shuck Disease

This is a physiological problem of Success and varieties with Success as a parent. Symptoms include the tip of the nut turning brown and opening 1 to 3 weeks early. An abscission zone on the peduncle of the cluster develops prematurely and restricts nutrient and water flow. Losses vary from 1 to 100 percent.

Control. No control is recommended. Avoid use of the Success variety. Intensive farming practices such as proper disease and insect control, fertilizer application and sunlight management will increase yields. However, the percent shuck disease loss will remain approximately the same.

Sticky Shuck

This is a disease complex involving a fungus and possibly insects. Pecans damaged by sticky shuck develop extensive black, sunken lesions, usually at the stem end, in late July or early August. The pecans drop shortly after the lesions become apparent. This coincides with the initiation of the liquid endosperm period. This disease is not to be confused with the drop which occurs due to poor pollination or fertilization (failure of the male and female gametes to unite). Pecans

which drop due to sticky shuck grow and develop normally until they become infected. Pecans which drop due to poor pollination or lack of fertilization begin to slow down in their rate of development, and at the time of drop will be approximately two-thirds the size of the other pecans. The varieties Western and Wichita appear to be the most susceptible to sticky shuck.

Control. Demonstration results indicate that protection is obtained with fungicide sprays applied at the initiation of the liquid endosperm period, and at 2-week intervals thereafter for a total of two applications.

FOLIAGE DISEASES

Brown Leaf Spot

The brown leaf spot disease fungus, *Cercospora fusca* (Heald and Wolf) Rand, affects only mature leaves and usually does not appear until the latter part of May or mid-June. Primary lesions, small dots on the lower leaf surfaces, gradually enlarge and become reddish-brown with a grayish cast. The shape of the lesions may be circular or irregular, especially where two or more lesions develop close together. In seasons favorable for brown leaf spot development, pecan trees may be completely defoliated within 3 to 4 months if the disease is not controlled. Most pecan varieties, if maintained in a vigorous state of growth, are resistant to brown spot disease.

Vein Spot

Vein spot disease is caused by the fungus *Gnomonia nerviseda*. Symptoms of the disease are similar to the leaf lesion symptoms of scab disease; but vein spot, unlike scab, affects only the leaves. Vein spot lesions develop on the veins or stems of leaflets and leaves, are usually less than 1/4 inch in diameter and are characteristically dark brown to black. Severely infected leaflets and leaf stems drop, resulting in premature defoliation.

The fungus overwinters in fallen leaves. The following spring, when temperature and moisture conditions are favorable, spores formed in special structures called perithecia are forcibly discharged into the air and carried by wind currents to the newly formed spring foliage where they initiate primary infection.

Control. Fungicides used in scab control are effective against this disease. Sprays are particularly important in early and midsummer.

Leaf Blotch

Leaf blotch disease is caused by the fungus *Mycosphaerella dendroides* (Cke.) Demaree and Cole. The disease occurs mainly in trees of poor vigor caused by neglect, infertile soil, rosette or overcrowding. Nursery trees are particularly susceptible.

The fungus overwinters in fallen leaves. In the early spring, spores produced in old leaves on the ground are carried by wind currents to young leaves in trees where they germinate and rapidly invade tender leaf tissue.

The disease symptoms, small, olive green, velvety spots, first appear on the undersurfaces of mature leaves in early summer. By midsummer black, pimple-like dots become especially noticeable in the leaf spots after the surface spore masses have been removed by wind and rain. This gives the diseased areas of the leaves a black, shiny appearance. When the disease is severe, infected leaflets die. Defoliation in late summer or early fall results in reduced tree vigor which will reduce the crop the next year.

Control. Leaf blotch can be controlled effectively in the early spring by disking under old, fallen leaves that harbor the pathogen. In areas where a spray program for the control of scab disease is practiced, leaf blotch disease usually does not become severe. In localities where leaf blotch occurs in the absence of other pecan diseases, two applications of fungicide will control the disease effectively. The first spray should be at casebearer time, and the second should be made 3 to 4 weeks later.

Downy Spot

Downy spot disease, caused by the fungus *Mycosphaerella caryigena* (Ell. and Ev.) Demaree and Cole, attacks all pecan varieties. Only leaves are damaged by the disease. Primary infection of new leaves in the spring occurs from spores produced in specialized fruiting bodies in old, overwintered leaves. The downy spots appear during the summer months on the under surfaces of leaflets. The downy appearance of the lesions is due to the production of thousands of minute, fungal spores on the surface of each spot. The spores are spread by wind and rain to adjacent leaves and to neighboring trees. Lesions visible on both leaf surfaces are 1/8 to 1/4 inch in diameter and greenish-yellow. Later in the season the lesions turn brown due to the death of the leaf cells in the diseased area.

Moneymaker and Stuart varieties are most susceptible to downy spot disease, although all pecan varieties are moderately to slightly susceptible.

Control. Disk under old, fallen leaves in the early spring before the leafbuds begin to swell. This practice covers the leaves with soil and prevents the discharge of spores into the air, thereby controlling primary infections on new leaves. Sprays applied for scab control reduce the occurrence of this disease. Late summer and fall applications are essential to control downy spot.

Articularia Leaf Mold

Articularia leaf mold, caused by the fungus *Articularia quercina* (PK) Hoehn, is a disease of minor occurrence and importance. It most commonly attacks weakened trees following rainy periods and in areas of high relative humidity. On the lower surfaces of the leaves, the fungus produces conspicuous growths of white tufts which contain masses of spores.

Control. Articularia leaf mold generally does not occur in trees or in groves which have been sprayed for disease control. A single application of fungicide when the disease is first detected is usually sufficient to control the disease.

Bunch Disease

Although the cause of bunch disease is not known, evidence indicates that it is an infectious disease. Affected trees show the bunching symptom caused by excessive growth of slender, succulent twigs from lateral buds that normally remain dormant. In moderately affected trees one or several branches will show the "bunch" growth symptom. Bunching in severely affected trees may involve all main branches, which produce thick masses of sucker-like growth and few, if any, nuts.

Control. There is no known effective control for bunch disease. Early detection of the first symptom of bunch and pruning out of the affected branch may prevent spread of the disease throughout the tree. When the tree is severely affected, and limbs are involved, the tree should be destroyed to protect nearby healthy trees from infection. For propagation purposes, all bud or scion wood should be taken only from bunch disease-free trees.

ROOT DISEASES

Crown Gall

Crown gall disease, caused by the bacterium *Agrobacterium tumefaciens* (E. F. and Town.) Conn., can be damaging to pecan trees. Nursery trees, as well as trees in bearing pecan orchards, are susceptible. The development of galls is confined primarily to larger roots near the base of the tree trunk, although small roots may become infected and develop galls. The smaller galls are under the soil surface and cannot be detected unless the soil is carefully removed from around the roots. Large galls, often 10 to 18 inches in diameter, may develop on larger roots and can protrude well above the surface of the soil. Galls on nursery trees develop at or below the soil surface on the taproot and larger secondary roots.

Once crown gall develops on the roots of a tree it becomes systemic within the root system. Pruning the galls from the roots, although removing the obvious signs of the disease, does not remove it from the roots of the tree.

Control. All infected nursery trees should be destroyed. Crown gall-diseased orchard trees sometimes can be saved by digging the soil from around large roots and removing the exposed galls. Where galls were removed, the damaged root surfaces should be painted with a creosote-coal tar mixture (one part creosote to three parts coal tar) to prevent spread of the bacterium. Cultivation of the soil around the trunk base of infected trees should be avoided to prevent root wounds and spreading of the crown gall pathogen. Large, well developed trees which show signs of crown gall will be susceptible to other problems due to reduced vigor, but seldom die as a result of crown gall alone.

Cotton Root Rot

Cotton root rot disease is caused by the fungus *Phymatotrichum omnivorum* (Shear) Dugg., a soil-inhabiting pathogen that attacks a wide range of host plants including the pecan. The roots of the pecan tree are invaded during the summer when growth of the fungus in the soil is most active. Infected roots are killed, which disrupts the transportation of water to the leaves. Trees infected by cotton root rot produce yellow foliage, and shedding of leaflets occurs during dry periods. Affected trees die when the fungus girdles the roots.

Control. An effective control for cotton root rot has not been developed. New orchards should not be planted in soil having a history of cotton root rot.

Root Knot

Meloidogyne incognita (Kofoid and White) is the only nematode which has been found to infect pecans. Damage is characterized by stunted trees which show pronounced zinc deficiency. Small galls from 1/6 to 1/2 inch in diameter are formed on the root system. The problem is most often associated with nursery trees; however, large trees are sometimes severely damaged by root knot.

Control. Selection of nematode-free nursery stock is essential to the prevention of this problem. Chemicals, although effective, do not have Environmental Protection Agency clearance. Avoid planting in areas where root knot has been a problem.

NONPARASITIC PLANTS

Lichens

Lichens commonly are found growing on the branches and trunks of pecan trees, especially in humid climates and in orchards having poor air circulation. Lichens are nonparasitic to the pecan trees, and merely attach themselves to the bark surfaces. Lichens grow equally well on rocks, fence posts, bricks and other objects. There are several types of lichens that occur on pecan trees, none of which are damaging. Only tree appearance is affected.

Spanish and Ball Moss

Spanish moss, *Tillandsia usneoides,* and Ball moss, *Tillandsia recurvata,* L., are similar to lichens. They are not parasitic to the pecan tree and derive their nutritional requirements from the air, rain or atmospheric moisture. Neglected orchards in areas of high humidity or poor air circulation are most troubled with Spanish moss and Ball moss. When large and excessive growths of Spanish and Ball moss develop in pecan trees, the shading of leaves is detrimental to tree vigor. Ball moss also prevents lateral buds from developing normally.

Control. The Spanish moss and Ball moss plants, like pecan trees, require sunlight for vigorous growth. A pecan tree kept in a vigorous state of growth produces dense foliage that effectively shades Spanish moss and retards its growth. Spanish moss and Ball moss are generally not a problem in orchards sprayed with a fungicide for disease control. Ball moss has been controlled by spraying pecan trees regularly with Du-Ter® for scab control.

KEY TO PECAN DISEASES

Diseases of Leaves

Olive spots on undersides.	SCAB
Downy, buff or greenish-yellow lesions.	DOWNY SPOT
Small, reddish-brown to gray spots on undersides.	BROWN LEAF SPOT
Dark brown to black lesions on veins and stems.	VEIN SPOT
Tiny white tufts of fungal growth on undersides.	ARTICULARIA LEAF MOLD
Small, olive green, velvety spots. By midsummer, black, pimple-like dots appear in the spots.	LEAF BLOTCH
Leaflets yellowish, mottled, narrowed and crinkled with reddish-brown spots, and may be perforated.	ROSETTE
Broomy type of twig growth, and bunching of leaves.	BUNCH DISEASE

Diseases of Nuts

Small, black, sunken or raised spots which may fuse to cover entire surface of shuck.	SCAB
Pink spore masses on shuck surface.	PINK MOLD
Large, black, sunken areas which are shiny in appearance. May cover lower 1/4 to 1/2 of the shuck. Shuck does not shed; pecan drops.	STICKY SHUCK
Pecans open prematurely (1 to 2 weeks). Normal shedding of shuck; however, the pecans are not filled properly.	SHUCK DISEASE

Diseases of Roots

Small galls formed on small feeder roots.	ROOT KNOT
Galls of 1/8 to 2 inches on large roots.	CROWN GALL
Splitting and deterioration of bark of infected roots; strands of buff-colored fungal growth may be present.	COTTON ROOT ROT

Nonparasitic Plants on Limbs and Bark

Whitish-gray, moss-like masses on the bark.	LICHENS
Accumulations of grayish strands hanging from limbs and twigs, or gall-like growth on limbs and branches.	SPANISH MOSS, BALL MOSS

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